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12 November 1981

# Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 122

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## KAMBALDA SITE PROPOSED FOR RADIOACTIVE WASTE STORAGE

### Shipment From Singapore

Perth THE WEST AUSTRALIAN in English 8 Sep 81 p 5

[Text]

About 100 drums of radioactive waste will be shipped to WA from Singapore to be stored in a brick shed on Western Mining Corporation land at Kambalda.

The general manager of the nickel division of WMC, Mr B. J. Hurley, said that there would be no danger from the waste while it was in storage.

The 15m by 10m brick shed had been built to specifications set by the Radiological Council of WA.

It was in a salvage yard near a heavy industrial area and was surrounded

by a wire fence for additional security. The waste had not yet been returned from National Iron and Steel Mills in Singapore. He did not know when it would be returned.

The waste is believed to have become contaminated after a radioactive measuring gauge from WMC's Kambalda site was accidentally included in a shipment of scrap metal to Singapore.

### Protest Strike

Canberra THE WEEKEND AUSTRALIAN in English 12-13 Sep 81 p 3

[Article by Steve Harvey: "Radioactive Waste Row Halts Mine"]

[Text]

AUSTRALIA'S biggest nickel mine at Kambalda in the Eastern Goldfields of Western Australia is at a standstill because of a plan to store radioactive waste less than 100m from a residential part of the town.

More than 600 members of the Australian Workers Union employed by Western Mining Corporation walked off the job

late on Wednesday after the news leaked that the company planned to store the waste in a special building in a light industrial complex on Kambalda's outskirts.

The union is worried the town could become a nuclear dumping ground.

Negotiations between AWU organisers and the company in Perth on Wednesday failed to find a solution and a mass meeting of AWU members yesterday failed to end the

strike.

Yesterday workers were threatening to leave the town completely if the company went ahead. They will meet again on Monday.

The AWU is the only union involved in the dispute so far but other unions may join if there is no resolution on Monday.

The company agreed to store 100 drums of radioactive waste, contaminated in a Singapore furnace, earlier this year. The scrap metal became radioactive after a small device used to measure pulp density in a concentrator at Kambalda was accidentally shipped to the furnace in a load of metal.

After the accident was uncovered the Singapore Government asked for the waste

to be returned to Western Australia.

Western Mining agreed to store the waste but said it was not responsible for the contamination. The authorities are tight-lipped about when the waste is due because waterside unions say they will not let the waste into Australia.

An AWU organiser for the Goldfields region, Mr Alf Barwick, said the union was worried the shipment could set a precedent for storage of other radioactive waste in Kambalda.

The general manager of the nickel division of Western Mining, Mr Brian Hurley, said the radiation level of the waste was very low. The company was shocked by the emotional response from the men

#### Compromise With Workers

Perth THE WEST AUSTRALIAN in English 15 Sep 81 p 3

[Excerpts] Kambalda: Workers here voted to return to work yesterday after reaching a compromise with Western Mining Corporation over the storing of radioactive waste.

The workers, who last week went on strike until they received an assurance from the company that the waste would not be stored in the town, agreed to a proposal to have it buried between eight and 30 kilometres out of the town.

The suggestion came from a radiation specialist, Mr David Woods, who flew over from the Atomic Energy Commission in Sydney during the weekend.

Mr Woods addressed about 2000 unionists and their families at a public meeting yesterday morning and told them that the radiation in the wastes was of a very small level and could not be considered dangerous if the precautions he recommended were taken.

#### 110 Drums

The waste, consisting of 110 drums of furnace lining, 4500 litres of sludge from a scrubber unit and a solid mass of steel weighing 10 tonnes, was accidentally contaminated in Singapore three years ago when a radioactive measuring device was put in the furnace with the scrap metal.

Mr Woods said that the material should be buried in a pit between eight and 30 kilometres from Kambalda. A concrete slab should then be poured over it to foil vandals.

#### Soil Cover

A soil cover of at least half a metre should be placed on the concrete. This would effectively prevent any radiation leak from the waste.

Western Mining agreed to this proposal.

The unionists at the meeting expressed fears that measuring devices similar to the one that contaminated the metal could affect workers in the plant at Kambalda.

Mr Woods said that such devices were only dangerous during maintenance work when their cast-iron shields were removed.

CSO: 5100/7502

# ACTU CRITICIZES STATE SUBSIDIES FOR NUCLEAR INDUSTRY

Canberra THE AUSTRALIAN in English 15 Sep 81 p 17

[Article by Nicholas Rothwell: "Uranium Subsidies 'Poor Spending of Tax Dollars'"]

[Text]

GOVERNMENT subsidies for the Australian nuclear industry were bolstering "massive private investments" and preventing proper spending of taxpayers' money, the ACTU claimed yesterday.

The latest ACTU attack on the Federal Government's uranium policy claims investment by government, industry and foreign business in the uranium industry will have an overall detrimental effect on the Australian economy.

The ACTU policy reaffirmed in its new position paper, "Australia's Uranium Industry - Heading for Economic Catastrophe", calls for bans on the mining and export of uranium.

The paper, which will be sent to all affiliates of the ACTU, says Commonwealth subsidies for "uranium and nuclear matters" last year were \$50.4 million and far exceeded spending on solar energy and conservation projects.

"The only special tax

applying to the uranium industry is designed to compensate for environmental spending, and will raise no more than \$300,000 from Ranger and Nabarlek at peak production," the paper says.

But Government spending on environmental measures in the Alligator River region alone had cost \$6.9 million last year.

"This enormous subsidy to an industry which is lurching towards collapse is a poor investment of the taxpayers' dollars," the paper says.

Recent estimates had shown that despite subsidies to the American nuclear power generation system, nuclear energy was the most expensive form of power supply devised.

The job-intensive Australian "manufacturing industry" was being pushed aside by the capital-intensive mining industry in the scramble for investment dollars,

Only 250 permanent jobs had been created at Ranger and the investment rate for each of these was \$500,000, but the manufacturing industry could create jobs at a rate of investment many times lower.

Heavy investment in mining means demand for hard-to-find investment capital is pushing interest rates higher, so investment in job-intensive manufacturing industry is expensive and slow," the ACTU claims.

The result was fewer job opportunities and as governments around the world had come to recognise the "cold facts" about the nuclear industry, demand for uranium had fallen drastically.

These facts included, "inefficiency, danger, crippling capital costs, and public opposition".

A survey by the energy laboratory of the Massachusetts Institute of Technology (MIT) had concluded stockpiles of uranium held by nuclear nations would be released to the world market.

The ACTU says this

development will stop further purchase of uranium fuel by the nuclear power nations and producer countries will not make significant commitments for exports for deliveries much before "the end of the decade".

"The drunken dreams of five years ago, with their dazzling pictures of a uranium bonanza, have now vanished," the paper says.

The price of uranium had fallen and would fall further and there was no certainty Australian uranium could be sold at all, even at reduced prices.

The MIT report had referred to "Australia's relatively weak position" as a producer before the slump in demand.

"We can expect the big investors to move on in good time, or appeal for help to their sympathetic friends in government, but meanwhile workers will have uprooted themselves and their families to travel to remote locations with dangerous working conditions," the ACTU report says.

ANTHONY RAPS ACTU OPPOSITION, CALLS URANIUM INDUSTRY HEALTHY

Canberra THE AUSTRALIAN in English 16 Sep 81 p 4

[Text]

CLAIMS that the uranium industry was lurching towards collapse were yesterday dismissed in Federal Parliament as nonsense by the Minister for Trade and Resources, Mr Anthony.

Mr Anthony also branded ACTU opposition to uranium mining as "stubborn and ignorant of the facts concerning the industry".

"This head-in-the-sand attitude is just exposing them for not facing up to the realities of the situation," he said.

Mr Anthony added that this attitude didn't demonstrate the opinion of many sections of the union movement which were involved in the development of uranium.

He said the facts were that 478 nuclear power

stations were operating or under construction around the world.

A recent OECD report had pointed out that by the year 2000 some 29 per cent of the world's electricity power generation would come from nuclear sources.

To say that this development was not taking place was nonsense, Mr Anthony said in reply to the Mr Grant Tamberling (NCP, NT).

Mr Tamberling referred to claims that the uranium industry was lurching towards collapse, was a poor investment and that the dazzling dreams of the uranium bonanza had vanished.

Mr Anthony said Australian uranium mining companies had firm contracts to supply 35,000 tonnes of uranium worth about \$4000 million and more contracts were being entered into.

CSO; 5100/7502

BRIEFS

BEEF RADIOACTIVITY CHARGE--Canberra--A Queensland Labor Senator claimed yesterday Australia could be exporting radioactive beef to America unless there were stricter safeguards at the French-owned Ben Lomond uranium mine near Charters Towers. In his maiden Senate speech Senator Jones said uranium ore storage tanks at Ben Lomond last January had been fractured and was flooded during the annual northern downpour, causing an overflow of contaminated water into a nearby creek. "Tests by the Queensland Water Control Council on seepage from the ore stockpile showed radiation of more than 120 times the acceptable level," he said. "The rural press has played down the effects of the spill, despite 60 cattle properties and 6000 cattle lining the watercourse. Export and domestic beef, as well as milk supplies, could conceivably be contaminated in the event of any future radiation leakages. The effects of this could be far more devastating than any scandal so far. Water is a very contentious issue in the area. Pumps feeding Charters Towers luckily broke down at the time, forcing locals to rely on rainwater. If the pumps had not broken down, there could have been a disaster." Senator Jones called for safety standards to be investigated at Ben Lomond before the next wet season in a few months. [Text] [Brisbane THE COURIER-MAIL in English 17 Sep 81 p 3]

CSO: 5100/7502

## MP'S CONDEMN U.S. DECISION ON NEUTRON BOMB

New Delhi PATRIOT in English 22 Sep 81 p 8

[Text]

TWO hundred and ten members of Parliament representing the entire spectrum of political opinion in the country on Monday condemned the US decision to go in for the neutron bomb, reports PTL.

In a statement, the MPs—drawn from 18 national and regional parties and independents — said: "we strongly protest the decision by the Reagan administration to produce the neutron bomb which brings the world closer to a nuclear holocaust".

They called upon the United States to "halt the production of this inhuman weapon and to enter into immediate negotiations for banning all nuclear weapons for disarmament and world peace".

In another statement, the MPs emphatically condemned the invasion of Angola by the racist troops of the South African Government, threatening the freedom of a peaceloving sovereign State and endangering world peace.

We demand the immediate withdrawal of the South African troops and demand that the UN must enforce mandatory sanctions against

South Africa, the statement said.

The statements were signed by Cong-I members including Jy Shankar Dyal Sharma, Ram Niwas Mirdha, Nawal Kishore Sharma, Eduardo Faleiro, Jagdish Tytler, Chintamani Jena, K Lakkappa, Nihal Singh, Mohana Kidwai, Abida Ahmed, Uttam Rao Patil and Kusuma Krishnamurthy.

Among others who also signed the statements were Bhola Parwan Shastri and P Unnikrishnan of the Cong-S, Samar Mukherjee and Hiren Ghosh of the CPI-M, Indrajit Gupta, and Yogendra Sharma of the CPI, Ram Vilas Parwan and N P Shah of the Lok Dal, Manohar Dandavate and H K Mullick of the Janata Party, Satish Aggarwal and Hari Shanker Bhattacharya of the BJP, Tridib Choudhury of BSP, Harikesh Bahadur of the DSP, Chitta Basu of Forward Bloc, Chandrajit Yadav of the Janwadi Party, Sarbajit Muthu, ALADMK and C T Dandapani of the DMK.

CSO: 5100/7004

## DELHI'S ASSERTIONS ON TARAPUR ANALYZED

Calcutta THE STATESMAN in English 23 Sep 81 pp 1, 9

[Text] NEW DELHI, Sept. 22.—The Government's answers to questions on the Tarapur atomic power plant during the just-ended Parliament session were notable for their disclosure that the Indo-U.S. talks on resumption of nuclear fuel supplies to Tarapur had in effect failed, and their confident assertion that the plant would nevertheless be kept going.

In the somewhat excessively cautious official briefing at the end of the July talks here between the two countries on this subject, there had been no clear indication as to the fate of those talks.

Even the first round of talks in Washington in April had been described at that time, officially, as little more than preliminary in nature.

In the monsoon session of Parliament, however, the Government was refreshingly open about the matter.

The Government told the Lok Sabha that "during the last round of Indo-U.S. talks on Tarapur held in New Delhi in July, the U.S. side once again indicated, as it had in April, that it was not in a position to continue the nuclear supply relationship."

In other words, the bilateral agreement is destined to be terminated and all that remains is a discussion of the modalities of such termination.

This should end confused speculation on the subject.

On alternative fuel, again, there has been similar openness. In May, during the Budget session, the Prime Minister told the Rajya Sabha in a written reply that work on a feasible alternative to enriched uranium was in progress, "but it is not advisable to spell out details."

In the just-concluded session however, the answer given to a question on the subject of alternative fuel was the confident assertion that "the Government of India

is prepared with alternative measures to ensure continued operation of the Tarapur atomic power station."

In a variation of that reply, other questioners were told that "the Tarapur plant will be kept working with alternative means irrespective of further fuel supplies from the U.S.A."

The answers suggested also that mixed oxide fuel was the alternative. "Development work on indigenous mixed oxide fuel for the Tarapur plant has been carried out and found feasible", the Government told the Rajya Sabha on August 20.

On the question of the plant to reprocess spent fuel at Tarapur, there remains some confusion.

The Government told questioners that owing to the reluctance of the U.S. Government to complete the "joint determination" regarding the "safeguardability" of the reprocessing plant, reprocessing of the spent fuel had been delayed. That delay had forced the Government to carry out extensive modifications to augment the storage facility at avoidable expense and effort.

This is in conflict with earlier reports that in September last year the International Atomic Energy Agency, to which the application of the "safeguards" part of the Tarapur agreement had been entrusted, had examined the design details of the reprocessing plant at Tarapur and had come to the conclusion that safeguards could be satisfactorily implemented when the plant reprocessed power reactor fuel. In fact, the chairman of the Atomic Energy Commission, Mr. H. N. Sethna, was then quoted as having said that "the subsidiary arrangements have come into effect and now we are ready to commence reprocessing of power reactor fuel."

Incidentally, in answer to a specific question in the Rajya Sabha as to what decision had been taken

to reprocess the spent fuel stockpiled at Tarapur, the Prime Minister said last Thursday: "No decision has been taken yet."

The session was notable also for questions on whether India had approached other countries, such as France and Canada, for supply of enriched uranium for Tarapur. Members were told that India had not made any such approach. On the contrary, an offer of supply of enriched uranium "was mentioned by the then Soviet Premier, the late Mr. Korygin, during his visit to India in March 1979 but in view of the existing agreement with the U.S.A. the matter was not pursued."

The Government disclosed during the session that against the 14,500 kg of U-235 to be supplied by the U.S.A. during the 30-year period of the 1963 agreement, only 1,025 kg had so far been received. The actual uranium hexafluoride content of the supplies so far was only 252.4 tonnes.

Parliament was also told that no more fresh enriched uranium of U.S. origin was available now at the nuclear fuel complex at Hyderabad, and that hereafter only processing of scrap would be carried out. The enriched uranium section of the fabrication plant was already working at low capacity and was likely to close down "in the event of non-receipt of further supply of enriched uranium".

# AEC CHAIRMAN ON PEACEFUL USES OF NUCLEAR ENERGY

Lahore THE PAKISTAN TIMES in English 8 Oct 81 p 10

[Text]

RAWALPINDI, Oct. 7: The Chairman of the Pakistan Atomic Energy Commission, Dr. Munir Ahmad Khan, said Pakistan would continue its efforts to acquire nuclear energy for peaceful purposes.

In an interview with an Urdu magazine, he said it was the basic right of Pakistan to acquire energy for development, and added, "we are conducting our nuclear programme on our own resources. PAEC, he said, had evolved different varieties of wheat, cotton and rice which could greatly increase agricultural production. Agricultural produce could also be preserved for a longer period with the help of nuclear energy.

The Chairman said PAEC had also prepared a grass which, besides being used as fertiliser and fodder for cattle, could make the barren lands fertile. The commission was helping several hospitals in treatment of cancer.

He said top priority be given

to establishing a solid and large technological base without which no development could take place nor would the country absorb modern technology from abroad.

He said Sweden and Japan had proved that nuclear energy could greatly benefit development projects in many fields for the welfare of people.

Dr. Khan said sound education and skilled manpower were prerequisites for a strong technological base. He regretted that the standard of education was deplorable and research was not being conducted at the universities. Men of international repute were rarely produced by the Pakistani universities, he said.

After raising the standard of education a science policy should be prepared giving top priority to agriculture, natural resources and electronics.

He said the centre of nuclear studies had produced brilliant technologists who could greatly contribute to development of the country.—AFP

CSO: 510C/4503

## INDIAN EXPERT SPECULATES ON NUCLEAR CAPABILITY

New Delhi PATRIOT in English 16 Sep 81 p 2

[Text] US Assistant Secretary of State James Buckley has recently lent fresh vigour to the issue of sales of the F-16 'Falcon' aircraft to Pakistan. His statement in Bangkok comes close on the heels of statements by Pakistan's Foreign Minister Aga Shahi at seminars in Lahore and Karachi. Shahi's statements sometimes give the impression that the United States was dragging its feet on the F-16 commitment made by Buckley in Islamabad last June.

It was Buckley's visit to Pakistan which created a furor in India, coming as it did while Mr P V Narasimha Rao was in that country. The furor arose because the F-16 represents a level of sophistication which, India feels, would pose a grave threat to its national security. Also, the audacious use to which Israel put it in Iraq conjured the worst of scenarios. Exactly how many F-16s, and over what time frame, would be delivered to Pakistan remain a mystery. Although a Pakistani military delegation visited Washington and examined the F-16s, the basis of sale, whether cash or military credit, has still to be ironed out.

Aga Shahi has made it clear that no undertaking has been given about Pakistani renunciation of nuclear explosions. There is the Symington-Glenn Amendment to the US Foreign Assistance Act that forbids US economic or military credit to any country engaging in the manufacture of nuclear weapons through enrichment (Symington) or reprocessing technology (Glenn), but it does not forbid

in the case of Pakistan, President Carter had used the Symington provisions of the Act to cut off economic aid worth 40 million dollars, when it was discovered in April 1979 that at Kahuta, near Islamabad, an unsafeguarded enrichment plant was under construction. In May 1979, the then Assistant Secretary of State William Pickering went on record during a US Senate hearing, stating that at the Pakistan Institute of Nuclear Science and Technology (PINSTECH) at Nilore, near Islamabad, there was also in existence a pilot reprocessing plant, unsafeguarded and one-tenth the size of the one the French had contracted to build at Chasma barrage in 1976. The President of the French company, Saint Gobain Techniques Nouvelles, stated that 90 per cent of the vital equipment had been transferred and the remaining five per cent was unimportant. However, President Zia-ul-Haq, in an interview in 1979, claimed that the vital five per cent had been withheld.

To this day, the exact modus operandi which Pakistan will adopt for its bomb remains unclear. Irrespective of that, one must also stress at this stage that the linkage that the United States had sought in the past between supplies of military hardware and abnegation of the nuclear option is at present being also attempted in the case of Pakistan. How far it will succeed is anybody's guess, especially in the light of Aga Shahi's remonstrations to the contrary.

Regarding Pakistan's enrichment project at Kahuta, Islamabad has consistently claimed that it was for purely peaceful purposes and aimed at eventual fuelling of the 600 MW Chasma Nuclear Power Plant (CHASNUPP). If one were to grant this, then one also has to think of its precursor, a pilot plant that could produce small quantities of highly enriched uranium (HEU). Simon Henderson, correspondent of the Financial Times of London who was stationed in Pakistan in 1979, brought to light the existence of a pilot plant at Sihala, southwest of Islamabad.

Enrichment technology has several facets; the fluorine plant (or 'hex') is a crucial component. In the 'hex', uranium present in yellowcake is in the intermediate stage converted into uranium tetrafluoride (UF<sub>4</sub>) and finally into uranium hexafluoride (UF<sub>6</sub>). The latter is very volatile and hence is circulated as gas in the centrifuges which spin at twice the speed of sound to swirl and separate the weapons grade U-235 from U-238 in the gas.

The West German magazine, Stern, on 25 June this year made the revelation that Pakistan had signed a contract with a German firm named CES Kalthoff in Freiburg as early as March 1977 for the supply of components needed for a fluorine plant. It also mentioned the existence of a pilot plant in Multan which began operations in 1980. Since Multan is 370 km from Kahuta, the prospect of pumping UF<sub>4</sub> or UF<sub>6</sub> as gas 320 km to the centrifuges at Kahuta or Sihala with

grave security problems leads one to conclude that the Sihale plant might have been shifted to Multan. Nuclear physicists tell us that a 90 MW to 100 MW plant operating for one year can produce out of 8,000 kilograms (or 8 tonnes) of natural uranium hexafluoride, one uranium bomb (which requires a minimum of 15 kilograms of HEU).

One advantage of the centrifuge technique is that the drums that rotate can be added on as and when they are available. As a result, the process can go on in stages. The drums are made of hardened steel known as martensitic steel. The Director of the Pakistan Enrichment Project is Dr Abdul Qadir Khan, a metallurgist who is believed to have procured 6,200 martensitic age-hardened steel tubes. It is not clear how many drums can be produced from these tubes. An enquiry conducted by the Swiss government revealed that Vakuum Apparate Technik (VAT) in Haag, Switzerland, had in the past supplied vacuum related high precision equipment to Rawalpindi. Another Swiss Engineering firm, KORA, had been supplying evaporators and condensers, which are vital for operation of a hexafluoride plant. The KORA facility was the target of a bomb attack on 20 March this year and in all probability Israel's secret service, MOSSAD, was involved.

Given all these facts, how can one dismiss the possibility that Pakistan has a nascent nuclear weapons capability? President Carter tried to halt this capability in early 1979, but his determination wilted before the end of that year following developments in Afghanistan. His successor, Ronald Reagan, who de-emphasised non-proliferation in his early months at the White House, backtracked and on 11 July this year announced a new non-proliferation policy. In the case of Pakistan, the favoured strategy is one of a trade-off of sophisticated military hardware against the Pakistani nuclear threat, to use Secretary of State Alexander Haig's terminology.

It is difficult to see the strategy succeeding because the United States too has expectations from

Zia-ul-Haq, especially in regard to the possible use of the Gwadar base for its Rapid Deployment Force (RDF) activity. Buckley's feeble attempts in the US Senate and in a letter to the Editor of the New York Times to draw a distinction between explosion of a peaceful nuclear device and of a nuclear weapon only show Washington's inability to influence the course of Pakistan's nuclear weapons programme.

When the pro-Zia newspaper, *Nawa-e-Waqt*, screamed in its headline on 5 July that the F-16s bring within their range targets such as Tarapur, Trombay and Kota, the worst of fears were aroused in India. One must, however, caution here that it is a long way from a nuclear explosion to the warhead that will be carried on the pylons of the F-16s. Also, the delivery date of the F-16s is yet to be decided by the US legislative process. Whether the US Senate and the House of Representatives will amend the Symington-Glenn Amendment before the end of this year one cannot say. But it does not seem likely that the process will allow military credits before October 1982, which coincides with the end of the next US fiscal year. Aga Shahi has often enough mentioned help from a friendly Islamic country, a reference to Saudi Arabia. As pointed out earlier, cash sales are not prohibited by the Amendment. If cash is forthcoming, Pakistan can immediately purchase F-16s from General Dynamics in the US. How many will depend on the cash available.

A word is in order for India's options. It is possible that the country will opt for a large number of squadrons of the Soviet MIG-25 interceptor version coupled with the Soviet Tu-126 AWACS. There are reports about the Tornado, a British DPSA (deep penetration strike aircraft), but whether foreign exchange stringencies will allow for that is anybody's guess.

Dr Subramanian is Research Associate, Institute for Defence Studies and Analyses, New Delhi.

## ARGENTINA

### PROGRESS OF TANDAR PROJECT DETAILED

Buenos Aires ESTO ES in Spanish Aug 81 pp 8-13

[Article by Omar Bernaola; part of the information contained in this paper was taken from a report published by the journal INTERCIENCIA (6, 93, 1981)]

[Text] The TANDAR [Argentine Tandem] project is one of the greatest efforts made by Argentina to strengthen its basic research program; it poses a real challenge to the CNEA's [National Atomic Energy Commission] physics department, because once it is completed, it will operate in permanent communication with its main counterparts in the world.

At the junction of the city limits with the province of Buenos Aires, a few meters from the intersection of Constituyentes and General Paz avenues, there is a new group of buildings among the INTI [National Institute of Industrial Technology] facilities and those of the Constituyentes Atomic Center. Particularly noticeable is a large cement tower with no windows. This is the main building housing the CNEA's TANDAR project.

The TANDAR project is now well underway; it is part of a general plan to develop and improve nuclear sciences. This project in particular has called for one of the greatest efforts in basic research made throughout Argentina's history. It offers a noteworthy challenge for the future to the scientists in the CNEA's physics department.

#### Background of the Project

The background of the project is closely related to the historic development of the physics department, which is located at the central CNEA headquarters in the city of Buenos Aires.

The CNEA was founded in 1950, and at that time the physics department did not exist as a separate entity within the institution. Nonetheless, a large number of the scientists who joined the CNEA in 1950 and 1951 were already working in the field of nuclear sciences.

As a more suitable support structure came to be provided, the work that would later justify the creation of the physics department began to take on importance. By 1952 there was a 1.2-MV Cockroft Walton particle accelerator, but the most significant event occurred in 1954, with the inauguration of the 180-cm Philips synchrocyclotron which can accelerate deuterons up to 28 MeV and alpha particles up to 56 MeV. By that time there were also magnetic spectrometers and a Calutron, which helped to stimulate work in experimental nuclear physics. Initially, the purpose of the synchrocyclotron was to irradiate internal targets and produce radioisotopes which the scientists used to study and develop the possibility of external irradiations. In 1957 a beam extractor was obtained for research projects. This led to the discovery of a number of new nuclides and proof of the existence of the diproton.

In 1966 the IALE [Isotopes Remote from the Stability Line] project was begun, and a line isotope separator was built and put in operation. This equipment used the Cockroft Walton accelerator as a neutron generator for the fission products source.

Also in 1966, discussions began about acquiring new equipment and about expanding the infrastructure. At that time the work on the new magnetic beam extractor from the synchrocyclotron was already in progress and the physics department used this opportunity to introduce improvements in the magnetic field and the radiofrequency of the accelerator.

In 1970 it was proposed to convert the synchrocyclotron into an isochronic cyclotron, but the project did not become a reality. However, these ideas were being discussed in a similar way at the Apache Project in Oak Ridge in the United States. This led the nuclear physics group to present a feasibility study in 1975 about the acquisition of a Tandem type accelerator.

In the meantime, the physics department was revitalized by the formation of an active theoretical physics group. The interaction between theoretical and experimental physicists has been quite beneficial. Proof of this is the painstaking work done on reactions ( $d^6$ , Li) with the synchrocyclotron.

In 1973 new physicists joined the group and a reactions program ( $\alpha$ , xn) was begun using the synchrocyclotron. In addition to obtaining results of interest, this work helped to improve the work done in cooperation with foreign institutions.

In 1976, approval was obtained for the acquisition of a Tandem type accelerator for heavy ions. Preliminary discussions were held with the High Voltage Corporation and the NEC [National

Electrostatics Corporation] in the United States. In 1977, it was decided to purchase a Pelletron 20 UD accelerator from the NEC, and construction began on 1 December of that year. The time scheduled for construction was estimated at 32 months; shipping time at 3 months, and assembly and testing at 15 months. It is expected to be operational in 1982.

The research plans of the CNEA's physics department for the next few years will be closely linked with the purchase of this machine, which will require a significant effort, along with a revitalization of the group of scientists working in the field of nuclear physics. Not only will the physics department with its nuclear physics, solid state physics, and theoretical physics groups have to adjust their plans to the new accelerator, but also other departments such as reactors, radiobiology, and special projects may also become increasingly interested in the efficient use of this accelerator.

At the same time, they should also expand the group of scientists in the physics department in order to have the new accelerator used efficiently.

Over all these years, the work of the physics department has covered a great variety of areas, not only in its fundamental area of applied research, but also in the generally unpublicized fields of the generation of support infrastructure (micromechanics, electronics, computers, radiological safety, etc.), without which any achievements in nuclear physics would be impossible.

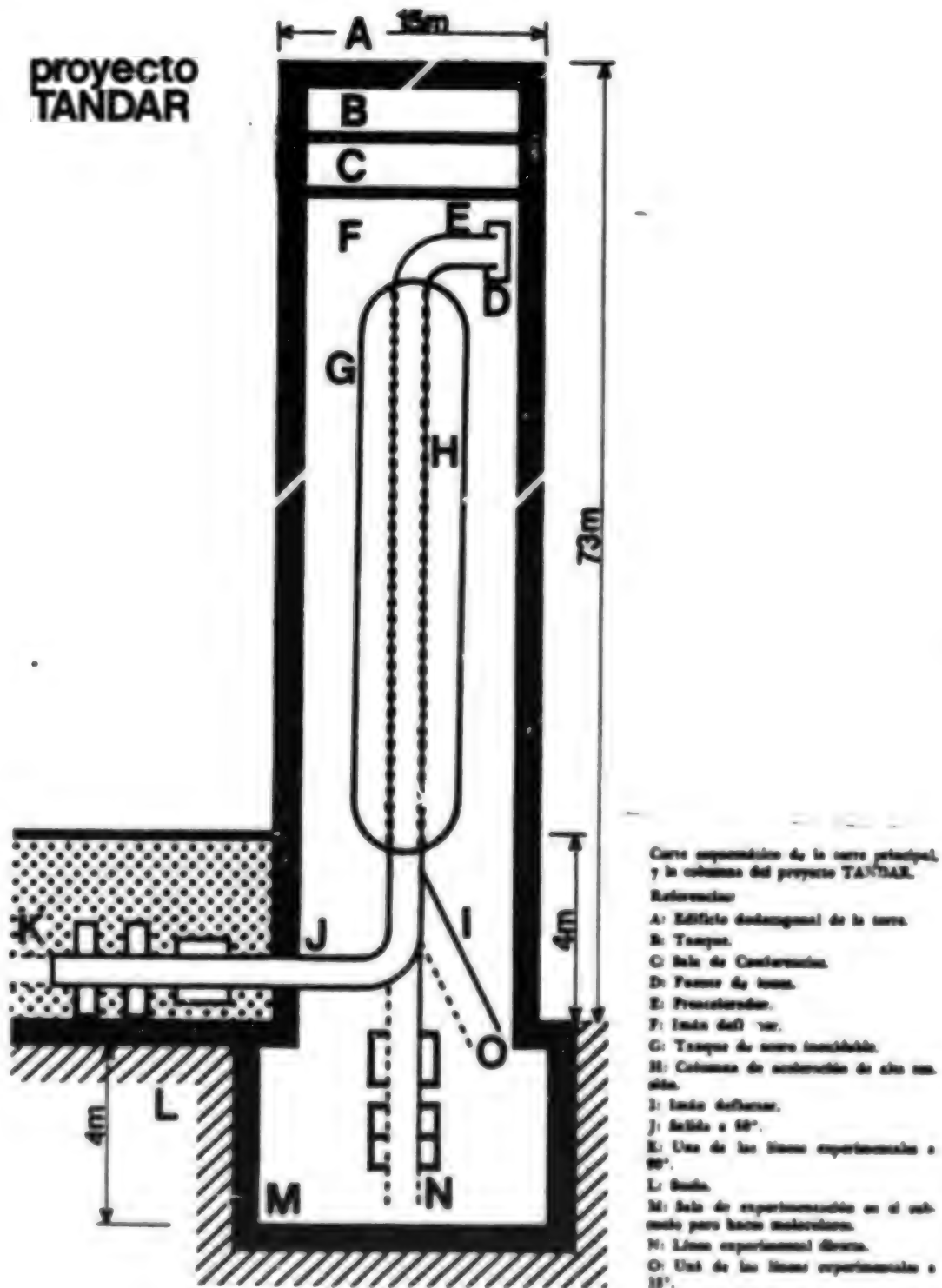
During the course of its short history, the physics department has worked on topics such as transfer reactions, gamma spectroscopy through reactions ( $\alpha$ , xn) and similar reactions, line studies of fission fragments, magnetic moments of excited states, hyperfine reactions, nuclear structures, nuclear reactions, applied nuclear physics, studies of radioactive decay, vibrational spectroscopy, crystal structures and phase transformations, Mossbauer spectroscopy, theoretical solid state physics, theoretical and experimental studies of the use of solar and wind energy, applied electronics, computers, and the development of particle accelerators.

#### The New Accelerator

The new accelerator is scheduled for 20 MV; the acceleration system is of the Pelletron type; it has a number of well differentiated sections, and is designed to include the latest advances in particle accelerator technology.

Figure 1 below shows the operation of the accelerator in schematic form.

# TANDAR project



Key for Figure 1:

1. Schematic view of the main tower and column for the TANDAR project.
2. References
- A. 12-sided tower building
- B. tank
- C. conference room
- D. ion source
- E. preaccelerator
- F. deflector magnet
- G. stainless steel tank
- H. high voltage acceleration column
- I. deflector magnet
- J. 90° outlet
- K. one of experimental lines at 90°
- L. ground level
- M. underground experimental room for molecular beams
- N. direct experimental line
- O. one of experimental lines at 15°

In the upper part of the tower is the ion source which provides the ions which are to be accelerated. At this level, there is a horizontal preacceleration phase which acts as the ion beam injector into the high voltage acceleration phase.

After being preaccelerated, the ion beam is curved to 90° by a deflector magnet so that the beam can be injected into the vertical high voltage phase. In this phase, the ions are accelerated toward the base of the tower, where they are again deflected by a deflector magnet to obtain a horizontal beam that will be directed toward the different experimentation lines. It is also possible to have direct beams and beams deflected 15° in relation to the vertical line.

If we analyze in greater detail the operation of the various phases, we can say that the injection system, which includes the ion source, consists of a low voltage column, an electrostatic injector with a magnetic deflector, and three modules of interchangeable ion sources, to provide the system with greater versatility.

The low voltage column of the injector is designed to withstand 300 KV of continuous negative voltage, and inside the column the ions are accelerated in a high vacuum. The beam thus generated and pre-accelerated is then deflected to 90° by a dual focus magnet, which not only introduces the beam in the acceleration phase, but also removes any undesirable components from it.

At the same time, there is a pulse system that produces ion pulses of about a nanosecond after acceleration; this system is located at the low energy input of the machine. The system can be used for both light and heavy ions.

Next is the high voltage acceleration phase which provides a maximum acceleration voltage of 20 MV between the injection system and the mid-part of the acceleration column. This column is built in modules and is 34.84 meters long. Then, between the middle of the column and its lower end there is also 20 MV maximum voltage, so that with load exchangers applied to the middle of the column, there can be a net acceleration throughout the column of 40 MV.

As the beam moves within the column at a pressure of about  $10^{-9}$  Torr., the dimensions of the building containing it would have to be enormous to permit a good area insulation, in dealing with such high voltages. For this reason, the high voltage acceleration column is enclosed inside a stainless steel tank which, once the column is installed, will be filled with sulphur hexafluoride. Because of this product's excellent dielectric properties the size of the building containing the accelerator can then be considerably reduced.

For the high voltage terminal load, two independent groups are used with two Pelletron type chains that can transport a load of 400 microamps to the terminal.

#### Complementary Systems

The control system was designed by combining light loops with mechanical rods, and the digital control system includes transmissions by CAMAC modules using a PDP 11/23 computer.

To provide service access to the column, two mobile platforms are used; one of these is ring-shaped and surrounds the column, while the other moves inside the column.

When the ions reach the lower part of the column, they have already reached the maximum energy the accelerator permits, so they are then available as projectiles to interact with the targets provided in the different experimental research lines. Therefore, at the output of the high voltage column, there are various ways in which the beam can be oriented in order to guide it to the desired region.

One possibility is to use the beam without modifying its output direction, so an experimentation room has been provided directly under the column, below ground level.



The stainless steel tank, already installed. Surrounding the tank, construction is starting on a cement tower. In the foreground can be seen, already built, the cement foundations for the spherical tanks that will contain the sulphur hexafluoride.

Another possibility is to deflect the beam to  $90^\circ$  again in order to place it once again in a horizontal plane. This is done by another deflector magnet mounted on a rotating base so that the beam can be supplied to one of 30 output windows that cover approximately  $270^\circ$  of the plane in which the deflector moves.

To supply the sulphur hexafluoride which will provide the insulation for the column, some special facilities have been planned. The insulation material will be stored in a gaseous state, unlike other plants of this size, which use liquid storage. A study done by the CNEA shows that both systems are equivalent in price when operating costs beyond a period of 10 years are taken into consideration. In these conditions, the gas storage system is simpler, more versatile, and more reliable. The system was designed and built with local technology. The storage is done in two spherical tanks 10 meters in diameter which are located outside the building, and which

have a volume of 520 m<sup>3</sup>. The insulating gas is supplied from these tanks to the column through special equipment, which includes pumping devices, noise abatement systems, and purification circuits.

The gas recirculation and purification system was contracted directly from the NEC. It has two turbocompressors which produce a continuous flow of gas to an aluminum absorption base. These turbocompressors act as dehydrators to remove any impurities that may be present in the gas, and before reinjection, the gas is cooled in a heat exchanger. Finally, the gas is filtered before being introduced in the tank. The system is designed with two dehydrators, so that when one is in operation the other can be reactivated by a 400°C hot air current.

#### Building Distribution

Logically, the main building is the tower structure that houses the tank containing the accelerator. This building has a 12-sided shape, a diameter of 15 meters, and a height of 73 meters. The design provides the stability needed for acceleration during periods of strong winds and intense solar radiation. It is also designed with an adequate concrete thickness to serve as protection against radiation when the accelerator accelerates protons and deuterons at maximum energy. This tower houses not only the accelerator itself, but also the ion source, the injector, and the 90° magnetic analyzer.

There will be a conference room in the upper part of the structure. Access to different levels of the tower will be provided by two elevators. One is a freight elevator, and the other, more rapid, is for passengers.

Great care has been taken in designing the experimental areas in order to provide great versatility for the experimental lines. Not only have they considered the size, shape, number of rooms and access points, but they have also tried to have the greatest amount of space possible available in the vicinity of the base of the accelerator for different project lines, combining this with ease of access to the controls, data handling, and service areas. The experimental rooms occupy approximately 270° of the sector. There are two multipurpose shielded rooms which can be outfitted with cranes. Two access doors with removable concrete blocs connect these areas directly to an outside route, and supply the space needed to bring in any possible heavy equipment that may be desired. There is a heavily protected area for high radiation experiments. This area was planned to accommodate part of the electromagnetic isotope separator.



The Constituyentes Atomic Center at the intersection of General Paz and Constituyentes avenues. Immediately behind this center, now under construction is the tower which will house the accelerator. The spherical tanks, in front of and to the right of the tower, are the storage tanks for the sulphur hexafluoride.

Also planned are two unprotected work areas. In the future these areas may be shielded and equipped for project work.

Directly below the  $90^\circ$  magnetic analyzer is an experimentation room designed for molecular beam studies using the  $15^\circ$  outlet.

The control room and data collection room are located on the lower level and have direct access to the experimentation rooms.

The gas handling facility is on two levels, so that the pumps can be located as close as possible to the tanks. For this reason the area has to be acoustically insulated from the rest of the work areas.

On the upper floors are located all the accelerator support laboratories, such as the electronics laboratory, the ion source development lab, the target preparation lab, sensors, and safety services.

In addition to the main building, where the accelerator and the complementary areas listed above are housed, the first phase of the TANDAR project also includes construction of workshops, its own power generation system, and storage facilities. Furthermore, the offices and laboratories of the scientists in the physics and radiobiology departments will be located in a three-story building with an approximate floor space of 700 m<sup>2</sup>, so these departments are to be transferred to this site from their present location in the CNEA's main headquarters.

Consideration is also being given to a later transfer to this site, to facilities whose construction is not included in this first phase, of the entire research division and the solar energy, reactor chemistry, and planning groups. The area initially planned for this second phase is about 5,000 m<sup>2</sup>.

#### Later Phases

Because of its versatility, the Tandem 20 MV accelerator can be used for a wide range of research activities. Some of the programs to be begun are described below.

Although the machine can handle about 30 different research lines, initially it will operate with only six. These lines will be equipped with everything needed to handle the beams and complementary equipment, depending on the requirements of each research project.

There are plans to begin four experimental research lines in nuclear physics: a number of multipurpose correlation tables for gamma spectroscopy from nuclear reactions; an electromagnetic isotope separation line; a multipurpose dispersion chamber for light and semiheavy ions; and a dispersion chamber for heavy ions.

Of these four lines, the first two are already in operation at the CNEA and will be transferred to the site of the new accelerator.

There is a plan to install a magnetic spectrometer, and its purchase has already been decided.

A VAX 11/780 computer with a 2.5-megabit memory has already been delivered by the Digital Corporation, and work on the software for this system has begun.

Other project lines are now in the planning stage. These are in the fields of nuclear physics, atomic physics, solid state physics, and radiobiology. Applied research may be done in fields such as metallurgy, dosimetry, and radiological protection.

When the physics department has the new accelerator, it will be able to handle problems such as elastic and highly inelastic dispersion, particle transfer, fusion, fission, measurement of "flight times," gamma spectroscopy after nuclear reactions, electromagnetic isotope separation, radiation-induced damages, nuclear structures, nuclear reactions, and applied nuclear physics.

When the TANDAR project is completed, it will be the greatest project of its kind in Latin America, and one of the main such projects in the world. This will enable the CNEA's physics department to become a strong research center, capable of working with other prestigious institutions, both in Argentina and abroad. It will also be an attractive research facility for training scientists, primarily for the Latin American nations.

Based on the schedules, we can estimate that the accelerator will be operating by the end of 1982, so we could expect the research program to begin sometime in 1983.

#### Training Specialists

Along with the design and construction of the accelerator, a program is also being conducted to train human resources, both for the short term and the long term. The plan calls for bringing new people into research projects and providing advanced training for personnel already in the field.

The initial program began in early 1977 with the hiring of eight scientists. In early 1978, six more scientists were added, and in following years there were plans to increase staff levels, based on the needs of the physics department. Now the scientists working in this training program are in postgraduate programs and are working on research projects, preferably of an experimental nature, in research centers in different parts of the world (Munich, Oxford, Rehovot, Stony Brook, Berkeley, Oak Ridge, Seattle, Copenhagen, Heidelberg, and the CNEA).

At the same time, some scientists from the department are at the NEC laboratories in the United States, working on the construction of the accelerator.

Working sessions are being held--the Nuclear Physics Workshop program--which include 2 weeks of conferences and discussions on issues related to the TANDAR project; international experts in the field are taking part in this program. To date, four such meetings have been held, the first two in 1978 and 1979 at the Balseiro Institute of the Bariloche Atomic Center, and the last two in 1980 and 1981, in the city of Buenos Aires. These meetings are partly intended to state in a more precise and detailed way the problems to be faced in the research to be done with the new accelerator.



Placement of the lid on the stainless steel tank. The high voltage acceleration column will be located inside this tank.

When the TANDAR project and the research lines are actually in full operation, the various departments that will use this accelerator may be able to make new and valuable contributions to the world's scientific knowledge. Considering the background of its short history and the professional seriousness of the work done at the CNEA, we are sure that this promising future will soon become a reality.

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REAGAN STATEMENT ON NUCLEAR POLICY CRITICIZED

PY252225 Rio de Janeiro LATIN AMERICAN DAILY POST in English 23 Oct 81 p 4

[Text] One of the most enjoyable characteristics of the present American chief executive is his informal, charming manner, always leaving his guest-hosts-interrogators feeling perfectly at ease. This is an excellent trait in a politician and one that has served Mr Reagan well. Unfortunately, we have been seeing rather too often the extension of this manner into situations and discussions where it is out of place.

The latest incident involves a casual, ill-conceived Reagan remark on nuclear policy that has caused dismay from Washington to Bonn. It is hard to believe, given the growing peace movement in Europe, that Mr Reagan could have been so naive as to suggest, as he did to several newspaper editors last week, that it is possible to wage a limited nuclear war on European territory. It is completely irrelevant to claim, as the State Department did after the event, that the concept of flexible response has for years formed part of NATO battlefield strategy. The problem at present lies in the minds of Europeans who are engaged in a collective mental recall of the results of two world wars fought in Europe, a recall that is being profitably assisted by Soviet propaganda. Within this context, Reagan's statements were rather like shouting, "fire," in a crowded theater and produced the predictable results. Editorial writers on both sides of the channel had a field day conjuring up the image of armed-to-the-teeth America being stampeded towards Armageddon by a smiling, inept old man.

The trouble here is that if Reagan or Weinberger or any of the administration hawks are to speak about arms they must realize there are two audiences. To date the Reagan people have delighted in talking tough and tossing their shoulders back in a swaggering gait; apparently hoping to convince the Russians a Reagan is not a Carter. At the same time though they must convince the Europeans there is necessity for the type of re-arming Reagan is proposing. Many of these new weapons are to be placed on European soil. These countries are democracies and their people must believe in the urgency of meeting the Soviet arms build-up on the past decade. If they do not, then the United States may find its allies pulling out from the current missile deployment agreement. Such a result would be disastrous for the free world. To prevent this, Reagan, the great communicator, must learn to measure his words more carefully when the discussion enters the realm of nuclear warfare. No nation in the world will remain allies for long with someone who admits he may be willing to sacrifice them in a limited war.

NUCLEAR CHIEF DENIES COST OVERRUNS IN NUCLEAR PROGRAM

Rio de Janeiro O GLOBO in Portuguese 11 Oct 81 p 34

[Interview with Brazilian Nuclear Corporations [NUCLEBRAS] Chief Paulo Nogueira Baptista by Walter Diogo of O GLOBO; time and place not indicated]

[Text] The Brazilian Nuclear Program continues to be a priority, so much so that investments of \$14 billion are scheduled for the nuclear sector in the next 15 years. Almost \$1 billion in equipment will be ordered annually from national industry.

In an exclusive interview with O GLOBO, NUCLEBRAS President Paulo Nogueira Baptista reiterated that the cost of the program is still \$24.8 billion: \$14 billion will be spent in the construction of nuclear powerplants; \$4 billion will be spent for fuel production and reprocessing plants and \$6.8 billion are for financing expenses for the loans which finance the program.

Paulo Nogueira Baptista asserts that the estimates revealed recently, which attribute new prices to the nuclear program, have no basis whatsoever. He reports that the uranium production unit in Pocos de Caldas, Minas Gerais, will still be inaugurated this year. The first part of the nuclear fuel plant in Resende, state of Rio, will be ready in February 1982.

O GLOBO: There is talk of new costs of the nuclear program. A document published days back says that the cost will be \$36 billion. NUCLEBRAS is talking about \$24 billion. What is the real cost of the program today? To what can those different versions be attributed?

Nogueira Baptista: The question of price is very complex. One of the difficulties in determining the cost, besides the special situation of the nuclear industry, is the fact that today we are working with money which does not have a constant value. This is not only so with respect to Brazilian money but others as well. That is why it is difficult to speak in the same figures always.

We have been careful to state a reference year with respect to the money about which we are speaking. For example, when we speak of the cost of Angra II and Angra III, we say that the cost is calculated on the basis of the value of July 1981. And we state that value in dollars, not because that expenditure is going to be made in dollars, because only part of it will be, but so that we can have a stable reference point to provide the people who pay for the execution of that:

program. The devaluation of the cruzeiro is continuing at such a rapid pace due to inflation that the mention of the cost in cruzeiros makes it difficult to understand the size of the amount.

O GLOBO: But what is the real cost foreseen today?

Nogueira Baptista: The cost of the eight nuclear powerplants contained in the Brazil-Germany Accord, plus the installations of the nuclear fuel cycle, was calculated by us at \$18 billion in 1980 money. That is an estimate of the direct cost. It does not include financing costs. That is another problem. That indirect cost has been used against us as if that did not also happen in other long-range projects. Financing costs vary a great deal.

Generally, when a project is initiated, what is done is the calculation of the indirect costs in terms of the return an investor would derive from investing his money in an alternate investment.

The Brazilian electric sector estimates at this time that the rate to be estimated for an alternate investment should be 10 percent. Actually, the final cost of any project is going to depend on the rates of interest actually paid. However, this is only learned after the project is completed. That depends on the financing obtained, the period of repayment and the rates at the time. Each financing has a different financing period. Therefore, the most that is done is to calculate, making an estimate of the profit if that money were invested elsewhere.

O GLOBO: But can a variation in the direct cost also be expected?

Nogueira Baptista: So that you may have an idea, it is enough to recall that the Itaipu powerplant had an estimated cost of \$3 billion when its construction began. Today its cost is estimated at \$12 billion. Now just imagine a program of more than 20 years.

The cost we consider as basic is the direct cost. The eight powerplants will cost \$14 billion. The fuel cycle plants will cost \$4 billion.

O GLOBO: Are the estimates published by the press real? How did those estimates come about?

Nogueira Baptista: We do not know who invented them. Actually they used a document which is a simple form used by the company in 1978 to make estimates of the cost of atomic powerplants. They used a form distributed in one of our seminars. The cost of powerplants was estimated in marks in that seminar and the figure used in the document distributed to the press talks about \$36 billion. There is not the slightest relationship between one thing and the other.

O GLOBO: One of the criticisms frequently made of the Nuclear Program is the timing of investing \$24.8 billion in the Center-South region for generating power in the most developed area. Would it be more advantageous for the country to use that amount of money in the production of hydroelectric power? It is a productive discussion...

Nogueira Baptista: It is not an investment of \$25 billion. We must speak of the direct investment, which is \$14 billion for the powerplants and \$4 billion for producing fuel.

Brazil is going to spend that \$14 billion in 15 years. In that same period Brazil is going to spend \$4 billion per year in the production of hydroelectric power, which means \$60 billion all together. Brazil is not throwing money away. It is making an investment in energy. That has one result: jobs and orders.

O GLOBO: Now, as to the problem of the timing of that investment?

Nogueira Baptista: The program is timely for several reasons. The present cost of a kilowatt produced by nuclear powerplants is higher than that of hydroelectric plants under construction. But it will not be higher than that of the new hydroelectric powerplants. The hydroelectric plants which will be built at the end of this decade will no longer be competitive with nuclear energy.

I believe that in 1990 nuclear energy will cost the same as hydroelectric energy. After 1990 the trend will tend to be reversed. Hydroelectric powerplants which produce energy at a low cost will cease to exist. However, nuclear energy will begin to decline in price.

There is another argument: Brazil has large uranium reserves. The Pocos de Caldas reserve is the one with the worst quality we have. Tataia is much better and much more promising. We can be great producers and exporters of uranium, a very valuable mineral in the world of today.

Let us discuss timeliness. Let us accept that Brazil would decide to exploit the 213,000 megawatts indicated in the surveys of usable water falls for the generation of electric power. Let us accept that Brazil would invest only in hydroelectric power and that the potential of 213,000 megawatts would be completely used, something which is not true. Actually the production obtained would be less. What would happen? In the year 2003 that potential would be almost totally in use and the country would need nuclear power in order to continue supplying the people. Obviously for Brazil to be able to build nuclear powerplants in the year 2000 it would have to begin its program in 1990. Therefore we would be a little bit ahead of schedule.

Now let us look at reality. What is going to be produced in hydroelectric power is quite a bit less than the 213,000 megawatts indicated in the inventory of usable rivers.

O GLOBO: Why is it quite a bit less?

Nogueira Baptista: Some of the usable falls could generate power at a cost estimated today at \$3,000, \$4,000, \$5,000 and even \$10,000. Today the kilowatt produced by a nuclear powerplant costs \$2,600. But it tends to decline. However, as I already said, cheap hydroelectric power will disappear in 1990. Obviously, many of the plants which produce at a very high price will not be used.

The government could opt for a postponement of the nuclear program until the decade of the 90's but it would have to simultaneously initiate the construction of eight powerplants in order to provide for the power needs of the country. Moreover, it would have to build those eight powerplants at an accelerated pace, develop the technology and make industry capable of producing equipment.

Now, what option was selected? It was decided to initiate the program of construction of the eight powerplants at a deliberate pace. We are going to arrive at the decade of the 90's with the majority of them operating to complement the supply of energy provided by the hydroelectric plants, but we shall have installed an industrial capability able to manufacture the plants and we shall have assimilated a technology which will be decisive for the country in the year 2,000 when we shall only be able to count on that type of energy for certain.

O GLOBO: Another criticism usually made of the Nuclear Program is with respect to the number of powerplants acquired. Several scientists say that Brazil could assimilate the technology by buying only four powerplants from Germany. Do you agree with the purchase of eight of them is excessive?

Nogueira Baptista: That is where the deceit lies. That is a lie which has been repeated in a very malicious way. What Brazil is buying is the technology for building the powerplants in Brazil.

At first we are going to use a certain amount of imported equipment which could even be very considerable.

O GLOBO: What is the degree of national manufacture of that equipment?

Nogueira Baptista: The foreign share will be 30 percent in the first powerplant. In the last one it will be 10 percent. Therefore, it is a lie to say that we are going to buy eight powerplants. Even the reactor itself will be built here in Brazil. The Sao Paulo powerplants will have reactors built in Brazil. What we are buying is the technology.

They also accuse us of buying junk. They say that our technology is obsolete. The truth is that German technology is one of the most advanced in the world. That is not said by the Germans but by the Japanese, French and others.

O GLOBO: Now, how are we supposed to understand the fact that the Germans bought only one atomic powerplant from the United States in 1950 and developed their technology, while Brazil has to build eight of them?

Nogueira Baptista: Well, the Germans took more than 20 years to develop that technology and to arrive where they are today. If we were to try to invent the reactor now, we would perhaps only arrive where they are now in 20 or 30 years.

O GLOBO: Another question being discussed frequently within the Nuclear Program is about the participation of the Brazilian scientific community. Many technicians continue saying that the program excluded Brazilian scientists. Do you believe that NUCLEBRAS should invest in research to develop that technology which is being assimilated? Do you believe that Brazilian technicians could develop that technology, that we are going to import, here in Brazil?

Nogueira Baptista: Nuclear energy is a relatively new activity which emerged with a clearly scientific base. A large part of the industrial development in the world did not have that same scientific base. The other technologies emerged with a certain independence with respect to science. In the nuclear area science came before the industrial phase. However, today the industrial phase has assumed the leadership in that activity. The scientists have become somewhat nostalgic.

O GLOBO: We are now seeing Brazil negotiating for the importing of fast breeder reactors from Italy. Could Brazil not invest in research and advance in that technology of the future?

Nogueira Baptista: We are investing a great deal in the training of personnel and in research. It is obvious that we are going to assimilate German technology and we are going to develop it. However, it is not a function of NUCLEBRAS to develop a new type of reactor. I have doubts that it is a priority for Brazil and that Brazil should invest heavily to reinvent things that have already been created abroad.

I believe that Brazil should follow closely, and with great moderation and objectivity, the research being done on fast breeder reactors. We do not have the scientific and technological base in Brazil for performing that type of research. We cannot presume in Brazil, a country which does not yet know elementary phases of the technological process, to invent more advanced reactors.

We need well-trained personnel here to follow developments abroad. Brazil does not have enough resources for investing in a research program.

O GLOBO: But does Brazil not run the risk of always having to buy technology?

Nogueira Baptista: We can only resolve that problem in the long term. We cannot invert the problems. To think that Brazil can avoid importing technology is not a practical reasoning. To think that Brazil can become independent in advanced areas is to think in an unrealistic manner.

Brazil does not have a space program. How could it be otherwise? To think of having the leadership in that type of technology is a vain pretension.

O GLOBO: Do you believe that the technology that Brazil is importing today from Germany could be produced in Brazil if the National Nuclear Energy Commission [CNEN] would give priority to its development by Brazilian scientists?

Nogueira Baptista: In no way. We do not have the human or financial resources nor the industrial infrastructure. We can do what Germany did throughout years, improve on foreign experience. However, it is impossible to develop a reactor of our own beginning from zero.

Even if we had an Einstein, he would not be able to do in Brazil what he did in the United States where there is a research structure in the universities, government laboratories and in industry. A structure where the scientist can talk with industry with no difficulty and acts jointly with it can quickly produce the equipment.

O GLOBO: The Nuclear Program is being implanted in the midst of a difficult phase in the Brazilian economy and requires many resources. Will it continue to be a priority area for investments next year?

Nogueira Baptista: Yes, it will continue to be. Energy is generally a priority item. There are momentary difficulties but they will be overcome. Brazil cannot cease to make investments in energy. The only way to overcome the difficulties in the balance of payments today is to resolve the problem of the structural vulnerability we have today from the energy point of view.

The Nuclear Program will continue normally next year. We expect to invest nearly \$14 billion in the next 15 years, which means almost \$1 billion per year in orders for equipment and services from national industry.

Construction of the Angra III powerplant should begin in the second half of next year. We expect to have the construction company in the project site by that time.

Nine large civil construction companies have already presented bids for construction. By May we shall have decided on a bid.

The competition for the selection of the company which will build Angra II will be judged in July 1982.

Moreover, by the end of the year we are going to inaugurate the Pocos de Caldas natural uranium production unit, and the fuel element plant of Resende in the state of Rio, in February 1982. The Nuclear Program continues to be a priority.

O GLOBO: Another question is the location of the powerplants. Many technicians advocate the theory that the population should be asked whether they want the powerplants. They advocate the holding of a plebescite as they did in Germany.

Nogueira Baptista: That is not correct. There was no plebescite in Germany, since it is even forbidden by the German Constitution, which is also one of the most democratic in the world. The plebescite, contrary to what some environmentalists argue today, is an institutional mechanism of consultation which is not very democratic. The plebescite was always used by the great dictators: It was used by Hitler in a very simplistic way, by Stalin and by Mussolini. It is forbidden in the German Constitution precisely because of the fear of the Nazi past. And now it is argued in Brazil that the plebescite is a democratic solution...

O GLOBO: Sweden held one, did it not?

Nogueira Baptista: Sweden held a plebescite after it already had a very large nuclear-electric program, among the largest in the world, which provides 25 percent of the energy needs of the country, because of a question of contingency, because there was that antinuclear wave in the world. Because of a certain political contingency the government had to make that type of consultation and the response was positive. And the government continues with the program. The result of the plebescite was in favor, not against.

There was a localized plebescite in Sweden, which was favorable; in Austria there was a localized plebescite (it was not of a national scope) and it was against.

O GLOBO: But you note that they are democratic experiences...

Nogueira Baptista: I do not know whether that is the best solution for a consultation, nor do I know that it is valid. It always happens under certain conditions. If the government had to submit all its decisions...

O GLOBO: There was a case in Germany where a powerplant was embargoed for years.

Nogueira Baptista: But that was not a plebescite. It was a judicial decision. A popular action. It was halted for some 3 years...

It remained idle for a long time. It caused great harm to the country. It was caused by minorities who are blocking the democratic process. What happens in Germany is a typical case of a minority, which because of the relative instability of the government coalition, manages to block government actions.

O GLOBO: Would you accept participation in a political decision in the nuclear area?

Nogueira Baptista: I would not fear it at all. I believe there is no program which has been discussed more in Brazil than the nuclear program; more than the PROALCOOL [National Alcohol Program], coal or any other. It is not true that it is not discussed, it is the most discussed. The problem is that such a type of consultation would not be democratic. Democracy to us is representative; it is the representatives of the people who have to be responsible, assume the responsibility and not return that mandate to the people through a plebescite. Whoever resorts to that type of procedure is generally of a dictatorial tendency, someone who poses questions on the basis of "yes" and "no" answers. Questions of that complexity cannot be answered in a simplistic manner.

Democracy is an objective and a means. Democratic objectives must be reached by democratic means. Democracy cannot be thought of as only a means for accomplishing authoritarian, dictatorial objectives. Democracy is something more complex than that. I believe that the adoption of processes, which are not very democratic, such as the plebescite, for the solution of clearly technical problems does not serve the consolidation of democracy in Brazil.

8908

CSO: 5100/2016

## BRIEFS

NUCLEAR FUEL EQUIPMENT--Israel is denying the assertion made in a new book, just published in New York, according to which Israel has equipment for the manufacture of nuclear fuel which has for many years enabled it to develop nuclear arms. According to the book, The Nuclear Barons, the equipment was purchased in France at the end of the fifties, when Israel received a French nuclear reactor. According to the book no publicity was given to the supply of the equipment for the production of nuclear fuel, which enables Israel to manufacture atomic bombs. A spokesman of the Israeli Nuclear Energy Commission told our correspondent Gadi Sukenik that the Israeli reactor is a research one with a 24-megawatt capacity, and Israel does not engage in the separation of nuclear fuel, nor does it use the reactor for military purposes. The spokesman recalled that similar denials have already been issued more than once by government officials in the wake of various reports in the foreign press. [Text] [TA251122 Jerusalem Domestic Service in Hebrew 1100 GMT 25 Oct 81]

CSO: 5100/4704

KOEBERG NUCLEAR REACTOR CONSTRUCTION VIEWED ON SCHEDULE

Paris AFRICA AFP in English 6 Oct 81 p 27

[Text] Cape Town, October 3--The first reactor of South Africa's nuclear power station at Koeberg, 30 kms (20 miles) from here, will be ready to go on line in mid-1982, but the authorities have still not solved the question of enriched uranium supplies.

Slightly more than five years after South Africa's Electricity Supply Commission (ESCOM) gave the contract to three French companies construction work is well on schedule.

Some 400 Frenchmen are among the 4,500-strong labour force working round the clock along the windy sand dunes to the north of Table Bay.

When it is operational the Koeberg station's two reactors will produce a total of 1,800 kilowatts--about 10 percent of national demand--and take South Africa into the exclusive club of countries with nuclear power stations on grid.

The Republic is well endowed with coal deposits, which fuel about 80 percent of national electricity supplies, and is being cautious about moving into the nuclear power age.

Future Uncertain

There has been no decision of whether other nuclear stations will be built.

Nor is there any indication that ESCOM will have solved the problem of uranium supplies before the Koeberg station's scheduled completion date.

The United States agreed in 1974 to enrich sufficient South African uranium for Koeberg, but now refuses to re-export it to France where it is transformed into combustible pellets. This is the result of a decision taken by Washington in 1978 not to export fissionable materials to countries which had not signed the Nuclear Non-Proliferation Treaty.

South Africa has declined to sign the treaty because this would open the way to international checks on all its nuclear installations, and the Pretoria Government wants to keep some of these under wraps, particularly the ultra-secret Valindaba centre near the capital.

Specialists here say that the South Africans, who claimed to have invented a new enriching process, will not be in a position to enrich uranium themselves before 1985, three years after Koeberg is ready.

It remains to be seen what will become of the 2,300 million rand (2,500 million dollar) project if South Africa is unable to find about 75 tons of enriched uranium before the end of next year. (A.F.P.)

CSO: 5100/5603

## STATE RESEARCH FACILITY MODERNIZING ITS TEST NUCLEAR REACTOR

Helsinki HELSINGIN SANOMAT in Finnish 10 Oct 81 p 10

[Article: "New Control- and Adjustment System for Test Reactor"]

[Text] The State Technical Research Center is modernizing its test nuclear reactor. The reactor has been in operation in Otaniemi since 1961. It will now be equipped with a control- and adjustment system built on the basis of Finnish-Hungarian cooperation.

Also the operational safety of the reactor will be increased by moving the monitoring unit from next to the reactor vessel to a separate monitor building.

The previous significant modernization of Finland's only test reactor was accomplished in 1971. At that time its capacity was increased from a modest 100 kilowatts to a still relatively modest 250 kilowatts.

Finland's test reactor is the smallest in the world. Generally the test reactors in operation have a capacity 200 times that of Finland's reactor. However, the Otaniemi test reactor has properties which make up for its small capacity. Rather large amounts of radiation can be produced with this reactor in a short period of time.

The Otaniemi reactor will be especially suitable for training purposes after its modernization. With the help of the nuclear power plants it can be used in medical research and in environmental protection engineering as well as in geology, the processing industry, and scientific research on materials, states sources from the VTT [State Technical Research Center]. According to Professor Juhani Kuusi, director of the Reactor Laboratory, the Otaniemi reactor can be used until the year 2000.

## Modernization Will Cost 2 Million

The control- and adjustment system should be completed by the middle of November. According to Doctor of Engineering Bruno Barsi, project director, it is the result of a study begun in 1977. The modernization of the equipment will cost approximately 2 million markkas.

The basis for this modernization has been that the mechanical portions of the reactor are in good condition, but its instruments have become obsolete.

The old system was difficult to maintain and partially modernize. On the other hand, the new equipment is designed so that it can be expanded according to the development of technology.

The modernization of the American-built test reactor at Otanieni will make it even more international. The Physics Research Institute of the Hungarian Academy of Sciences will produce approximately 20 percent of the new instrumentation. The modernization of the test reactor is also a monopoly area for Valmet, which will produce 80 percent of the equipment.

Originally the test reactor was primarily used for training purposes. In recent years it has had increasing significance in practical tasks, states sources from the VTT.

#### Advantage Based on Neutrons

The advantage of the test reactor is based on the neutrons thrown off from its uranium fuel. The neutrons make elements radioactive in a different manner and on the basis of the differences very small substances can be studied.

Borrowing an example from geological research it is pointed out that it is possible to analyze the gold content of a rock sample, which in relative linear units is approximately one-half millimeter of 100 kilometers.

Radioisotopes used in medicine can also be produced by these neutrons. With them it is possible to study, among other things, the condition of kidneys and disturbances of cerebral blood circulation, which are otherwise difficult to examine.

The VTT Reactor Laboratory also conducted material studies by which it has been possible to observe the degree of brittleness in the pressure vessels of the nuclear plants. The results of research have concluded that the fuel in Loviisa 1 has already been reduced by approximately 10 percent and the fuel in Loviisa 2 will be reduced in connection with the next annual maintenance check.

#### The Reactor Is Safe

Not as much attention was given to the safety of the Otanieni reactor when it was built as is now being given to the safety of the nuclear reactors. The Otanieni test reactor does not, for example, have an airtight protective shelter.

Experts still consider it to be exceptionally safe. This safety factor is a result of the reactor's fuel, which extinguishes itself. In practice this means that even though the nuclear reactor is not stopped, the reaction will not continue, but will burn down to its original point.

10576

CSO: 5100/2011

FRANCE

AEC HEAD CITES NEUTRON BOMB MASTERY, BUDGET NEEDS

Paris LE MONDE in French 6 Oct 81 p 48

[Text] The AEC [Atomic Energy Commission] is well on the way to achieving mastery of the enhanced radiation weapon, otherwise known as the neutron bomb. This was reported to the deputies by Michel Pecqueur, the AEC's general administrator.

Mr Pecqueur spoke to the members of the defense commission of the national assembly on Wednesday, 30 September, at the Palais-Bourbon. He was accompanied by Jacques Chevallier, director of military applications at the AEC: Mr Chevallier is in charge of studies, research, testing, and fabrication of nuclear warheads and of naval nuclear propulsion systems.

The AEC's general administrator told the deputies that the neutron bomb, because of its lower collateral damages, could be fired closer to friendly troops and over a larger proportion of the territory without threatening urban areas. This factor makes it, he commented, a good defense weapon. Mr Pecqueur stressed the fact that if increasing the effectiveness of weapons tends to increase their credibility, then the result is that the more credible a weapon is, the less chance there will be of actually using it, for it will have a greater deterrent power.

Indicating that the AEC, after making great advances in the area of studies, is well on the way to achieving mastery of the neutron bomb, Mr Pecqueur added that the decision about whether or not to manufacture it is a political matter.

The AEC's general administrator then pointed out the need to use full-scale nuclear testing. Since 1975, France has conducted underground testing in Polynesia.

Mr Pecqueur stressed the fact that the physical phenomena which are produced in a nuclear explosion take place under pressure and temperature conditions similar to those prevailing in the sun, and

thus these conditions can not be reproduced in a laboratory setting. He explained that this is one of the reasons justifying full-scale testing. Another reason is the need to really try out these weapons, for phenomena could occur which might not be detected in calculations and simulations.

Then the AEC's general administrator gave the reasons why he feels the budget of the military applications division should cease to decline in relative terms.

In general, he said, after the government funding of equipment during 1965, 1966, and 1967, required by the construction of the Pierrelatte plant, the portion of the gross domestic product allocated to the AEC for military purposes declined from 0.27 percent in 1968 to 0.11 percent in 1978. This proportion has since tended to rise, because of the need to maintain new weapon systems and to prepare for the future. Furthermore, we must replace test equipment designed between 1968 and 1978, which has aged and needs to be replaced.

7679

CSO: 5100/2013

## FRANCE

### VIOLENT ANTI-NUCLEAR DEMONSTRATIONS PRECEDE DEBATE

#### Golfech Site Penetrated: Arson

Paris LE MONDE in French 6 Oct 81 p 14

[Article by Catherine Laurens]

[Text] Toulouse. The anti-nuclear forces opposing the Golfech plant have taken action. On Sunday, 4 October, during one of the largest demonstrations ever held in the region, they clashed with security forces.

Toward 1400, from 5,000 to 6,000 persons, according to the anti-nuclear coordinating committees, or 1,000 persons, according to EDF [French Electric Company] sources, began to march from Valence-d'Agen to Golfech (Tarn et Garonne department). The march, which was to lead to a site close to the plant which belongs to the environmentalists, proceeded calmly until about 1600. Then, while they were near the site, some demonstrators began to break down the fence.

The demonstrators then penetrated the site, where they burned several cars and sheds.

Then a squadron of 85 mobile gendarmes, until then invisible, intervened to clear the site, using tear gas grenades. As they were moving back, the demonstrators set fire to some EDF offices and blocked highway 113 with a barricade of burning tires. The clash lasted until nearly 2000 hours.

Mr Jean-Pierre Sielberstein, EDF's construction supervisor at Golfech, estimated the damages at 15 million francs. "The big dredger was badly damaged," he said. "I don't understand why they took such a highly undemocratic action when the debate in the assembly is to take place this week. This demonstration is even more incomprehensible as work at the site has been frozen since 30 July of this year by order of the council of ministers."

The environmentalists, members of the PSU [Unified Socialist Party], Young Farmers, and people from the region joined together behind Mr Paul Lafon, the mayor (without a nuclear "label") and some members of the municipal council, to protest.

"So far, people have treated us southerners as fools," said Jacques Paltz, a member of the regional coordinating committee. "We have advocated nonviolence, but obviously this hasn't worked. At Plogoff people fought to get what they wanted. Today we acted like the people of Brittany. The movement was spontaneous. We are determined to go to the bitter end if the plant is built. They tricked us. We voted for the left against nuclear power. Now Mitterrand is playing Giscard-style politics. We now have only one hope left: Paul Quiles, the chairman of the energy commission."

#### Paris PSU, Communists, Others

Paris LE MONDE in French 6 Oct 81 p 14

[Text] A demonstration against the government's nuclear program was held on Saturday, 3 October, at approximately 1500 hours, at the Place de la Bastille in Paris. About 3,000 persons took part. The demonstration was organized jointly by the PSU, the National Anti-nuclear Coordinating Committee, the Political Ecology Movement, the Revolutionary Communist League, the Union of Libertarian Communist Workers, and the Communist Committees for Management by the Workers.

Behind a large banner saying "Stop the Nuclear Program! For a True Democratic Debate!" the demonstrators began to march at about 1530. Their route followed the Rue Saint-Antoine, the Place du Chatelet, the Quai de l'Horloge, the Rue des Saints-Peres, and the Boulevard Saint-Germain.

The march would have reached the national assembly without incident, where it would have disbanded, if from 200 to 300 outsiders had not joined in the demonstration. The first disputes occurred shortly after the start of the march, in front of the Palais de Justice, which was guarded by the police. Shouting "Free our comrades!" and "Mitterrand is a fascist!" the demonstrators hurled a number of projectiles at the police, who responded by the use of tear gas grenades. A little later, the windows of a police vehicle were broken on the Boulevard Saint-Germain, while a motorcycle policeman was tossed off his motorcycle.

Because of these incidents, the organizers of the march decided to order it to break up at 1730, somewhat earlier than planned, at the intersection of the Boulevard Saint-Germain and the Rue du Bac. At that moment a small group of outsiders went to force open the doors of the ministry of transport, at 246 Boulevard Saint-Germain. In a few minutes a car parked in the courtyard was set on fire and its windows were broken.

It took nearly a quarter of an hour for two fire trucks and police forces to get there, even though they were all over the area at the time. The violent demonstrators in the meantime had plenty of time to disappear after posing for photographs.

Calm was restored shortly afterward, while police on motorcycles patrolled the entire area of the sixth and seven arrondissements, in order to prevent any possible new outbreaks.

(At the public security office--the prefecture of police of Paris--it was reported that this delay of about 15 minutes between the start of the fire in the automobile parked in the courtyard of the ministry and the arrival of the police and firemen at the scene occurred because the information about these incidents did not reach the operations command center until 12 minutes after the incidents happened).

7679

CSO: 5100/2013

## NETHERLANDS

### EDITORIAL ON SIGNIFICANCE OF ANTINUCLEAR POWER MOVEMENT

Amsterdam ELSEVIERS MAGAZINE in Dutch 26 Sep 81 p 59

[Text] It would be a pity if the discussion about the "shut down Dodewaard" demonstration is bogged down in mutual recriminations of demonstration leaders and the authorities. For there is certainly something more involved than the question of how the demonstration "got out of hand" and whether the Mobile Unit did not hit too hard. If the discussion is limited to that, then a Dodewaard will soon appear somewhere else or under another slogan, with an escalation of its bloody scope.

It is obvious that all those thousands alarmed about the environment who dared again prematurely to express their conviction deserve respect. Their mass presence around the nuclear power plant shows how much the energy problem affects broad strata of our people. But what must the authorities do about such a demonstration in practice? May this influence important policy decisions and if so, to what extent? And may it be involved in determining the result of the broad social discussion which must be conducted about the energy problem? The cry "shut down Dodewaard" has the drawback that everyone may wonder whether it is an emotional expression of a large number of angry people rather than a conclusion based on rational ideas. Therefore the demonstration cannot be regarded as a meaningful contribution to the broad social discussion. At the most, it again emphasizes its importance.

Consequently, what has been the deeper social meaning of the drama which was enacted at Dodewaard. Whoever listens to the organizers comes to the conclusion that it ultimately involves something more than shutting down our two nuclear power plants; it involves the re-organization of our democracy. An important characteristic of the antinuclear power movement is its unverifiability. The antinuclear power movement is not registered anywhere. It consists of a series of anonymous "basic groups." There is perhaps a national consultative organization but the basic groups are "autonomous." This means that really no one is responsible for the words and deeds of the AKB [Anti-nuclear Power Movement], nor can anyone say what is the social

importance of this group. The AKB's assertion that it speaks in the name of the "rank and file" and "the majority of our people" is a flimsy claim.

The AKB often becomes involved in antidemocratic activities on the basis of this unsubstantial claim. Even before government and parliament had decided whether the two nuclear power plants would remain open or not, the AKB cries "shut down Dodewaard" and reinforces that cry with stubborn efforts for a blockade. Those efforts themselves are an act of violence, regardless of whether in so doing a stone or a Molotov cocktail more or less was thrown. For the elected parliamentary majority must yield to the unverifiable group which arbitrarily calls itself a majority. If the genuine, verifiable majority reacts to that with the aid of the Mobile Unit, that is called violence. For the unverifiable majority is sovereign and inviolable. That is the philosophy of many AKB spokesmen; a philosophy which opens the way for violent behavior against any other decision of government and parliament.

It is high time to recognize the threat involved in this philosophy. Perhaps it is encouraged by the introduction of the broad social discussion. There are two objections attached to this phenomenon, however well intentioned it may be. The first is that it really is superfluous, because a well functioning democracy, by its nature, should be a broad social discussion; the second objection is that explicitly setting up such a discussion, and that with the capital letters BMD [Broad Social Discussion], expresses insecurity about the powers and capacities of our own elected parliament. But even that broad social discussion does not go far enough for the AKB spokesmen; they refuse to take part in it. For they have their own "democracy" which is neither visibly broad or visibly social.

The baffling thing about "Dodewaard" is not the effect of the philosophy of the hard core in the AKB, but the ease and the innocence with which responsible politicians support that philosophy. Some of them make the mistake of not drawing any clear distinction between a (non-violent) demonstration and a (violent) blockade. It was besides understandable that the government allowed a meadow at Dodewaard to be "occupied" (which, according to law, is always an illegal act) and that the same government did nothing when the demonstration leaders set up a radio transmitter on the occupied land. But toleration went too far when on the occupied land, against all the rules of normal PTT [Postal and Telecommunications Service] operation, a telephone installation was provided, with the help of which the blockade was organized. Finally the AKB demonstration was not ended by the ME [Mobile Unit] but by the citizens. It was a sign on the wall.

Showing respect for a peaceful demonstration is commendable. But government assistance in committing violence is all too foolish. If there still must be a broad social discussion, then there is a subject which goes beyond the question whether nuclear power plants must remain open or must be shut down. The main question is then: how do we defend our democracy against those who are besieging it?

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